



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/560,160

01/29/2007

Kenji Kohiro

3885-0109PUS1

9498

2292 7590 06/24/2010  
BIRCH STEWART KOLASCH & BIRCH  
PO BOX 747  
FALLS CHURCH, VA 22040-0747

EXAMINER

NADAV, ORI

ART UNIT

PAPER NUMBER

2811

NOTIFICATION DATE

DELIVERY MODE

06/24/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/560,160	<b>Applicant(s)</b> KOHIRO ET AL.	
	<b>Examiner</b> Ori Nadav	<b>Art Unit</b> 2811	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 April 2010.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-18 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claimed limitation of “an InGaP buffer layer or InGaAsP buffer layer is grown on a GaAs substrate”, as recited in claims 9 and 10, is unclear as to whether said element is (GaAs substrate) the same element recited earlier, or a different element.

The claims alternately recite the limitations of “the InP crystal or **a** compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs” and “the InP crystal or **the** compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs”. It is unclear as to whether said two elements are the same elements, or different elements.

The claims alternately recite the limitations of “the InGaP buffer layer or InGaAsP buffer layer” and “the InGaP buffer layer or **the** InGaAsP buffer layer”. It is unclear as to whether said two elements are the same elements, or different elements.

The claimed limitation of “the compound semiconductor crystal”, as recited in claim 18, is unclear as to which compound semiconductor crystal applicant refers, since said element was not recited earlier in the claim.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 18, as best understood, is rejected under 35 U.S.C. 102(e) as being anticipated by Kudo et al. (2003/0062538).

Regarding claim 18, Kudo et al. teach in figure 4 and related text a method of producing a compound semiconductor, which comprises forming on a GaAs substrate 1 an InP crystal 9 or a compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs, wherein the InP crystal 9 or the compound semiconductor crystal is formed on the GaAs substrate via an InGaP buffer layer 4 or an InGaAsP buffer layer and the thickness of InGaP buffer layer 4 or an InGaAsP buffer layer is not less than 5 nm and not greater than 500 nm (see Kudo et al., paragraph [0041]).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-17, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Kudo et al. in view of Ohkubo et al. (5,492,860).

Regarding claims 9 and 13, Kudo et al. teach in figure 4 and related text a method of producing a compound semiconductor by growing on a GaAs substrate 1 InP crystal 9 or a compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs, which method of producing a compound semiconductor is characterized in that:

an InGaP buffer layer 4 or InGaAsP buffer layer is grown on a GaAs substrate 1;  
and

the InP crystal 9 or a compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs is grown on the InGaP buffer layer or InGaAsP buffer layer, wherein

the growth of the InGaP buffer layer or the InGaAsP buffer layer is conducted to a thickness of not less than 5 nm and not greater than 500 nm.

Kudo et al. do not disclose the temperature at which the layers grow.

Ohkubo et al. teach growing an InGaP layer and an InP layer at 400 °C temperature.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to conduct the growth of the InGaP buffer layer or InGaAsP buffer layer at a temperature of not lower than 400 °C and not higher than 600 °C and growth of the InP crystal or a compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs is conducted at a temperature of not lower than 400 °C

Art Unit: 2811

and not higher than 700 °C, in Kudo et al.'s device in order to provide better quality crystal.

Regarding claim 10, Kudo et al. teach substantially the entire claimed structure, as applied above, including the InP buffer layer 5 is grown on the InGaP buffer layer or InGaAsP buffer layer.

Kudo et al. do not disclose the temperature at which the layer grows.

Ohkubo et al. teach the growing temperature of an InP layer.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form Kudo et al.'s device by forming the InP buffer layer in temperature to a prescribed annealing temperature and annealed, and the temperature is lowered to a prescribed crystal growth temperature for growing the InP crystal or compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs, whereafter the InP crystal or compound semiconductor crystal is grown, in order to improve the crystal quality of the layers.

Regarding claim 11, Kudo et al. and Ohkubo et al. teach substantially the entire claimed structure, as applied to claims 8 and 9 above, except forming the InGaP buffer layer to a thickness of not less than 5 nm and not greater than 300 nm.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the InGaP buffer layer to a thickness of not less than 5 nm

Art Unit: 2811

and not greater than 300 nm, in prior art's device in order to reduce the size of the device.

Regarding claim 12, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the InP buffer layer to a thickness of not less than 20 nm and not greater than 200 nm, in prior art's device in order to reduce the size of the device.

Regarding claim 14, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form prior art's device by forming the InP buffer layer in temperature to a prescribed annealing temperature and annealed, and then, before growing the InP crystal or compound semiconductor crystal whose lattice constant is closer to that of InP than that of GaAs, an operation for lowering the temperature from the prescribed annealing temperature to a prescribed crystal growth temperature and again raising it to the prescribed annealing temperature is repeated not less than one time and not more than five times, whereafter the temperature is lowered to the prescribed crystal growth temperature, in order to improve the crystal quality of the layers.

Regarding claims 15 and 16, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form prior art's device by using the

Art Unit: 2811

prescribed annealing temperature not lower than 650 (or 400) °C and not higher than 730 (or 700) °C in order to have better control over the growth of the layers.

### ***Response to Arguments***

Applicant argues that the combination is not obvious, because “the Ohkubo et al. '860 reference is related to a method for forming a compound semiconductor on a Si substrate, In contrast, the present invention is related to a method for forming a compound semiconductor on a GaAs substrate. As such, one of ordinary skill would not turn to Ohkubo et al. '860 for the temperature at which the layers grow since Ohkubo et al. '860 disclose an entirely different substrate from Kudo et al. '538 and the present invention.

Although the present invention is related to a method for forming a compound semiconductor on a GaAs substrate, and the Ohkubo et al. '860 reference is related to a method for forming a compound semiconductor on a Si substrate, the compound semiconductor material is not grown directly on the substrate. The substrate merely supports the grown structure. As such, the substrate can even be a temporary substrate, which can be removed and replaced after the growth of said structure is completed. Thus, since the substrate can comprise any material, it would be obvious for an artisan to use the Ohkubo et al. '860 reference.



***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Art Unit: 2811

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.  
6/22/2010

/ORI NADAV/  
PRIMARY EXAMINER  
TECHNOLOGY CENTER 2800